20220 6236h00T

FIG. 1

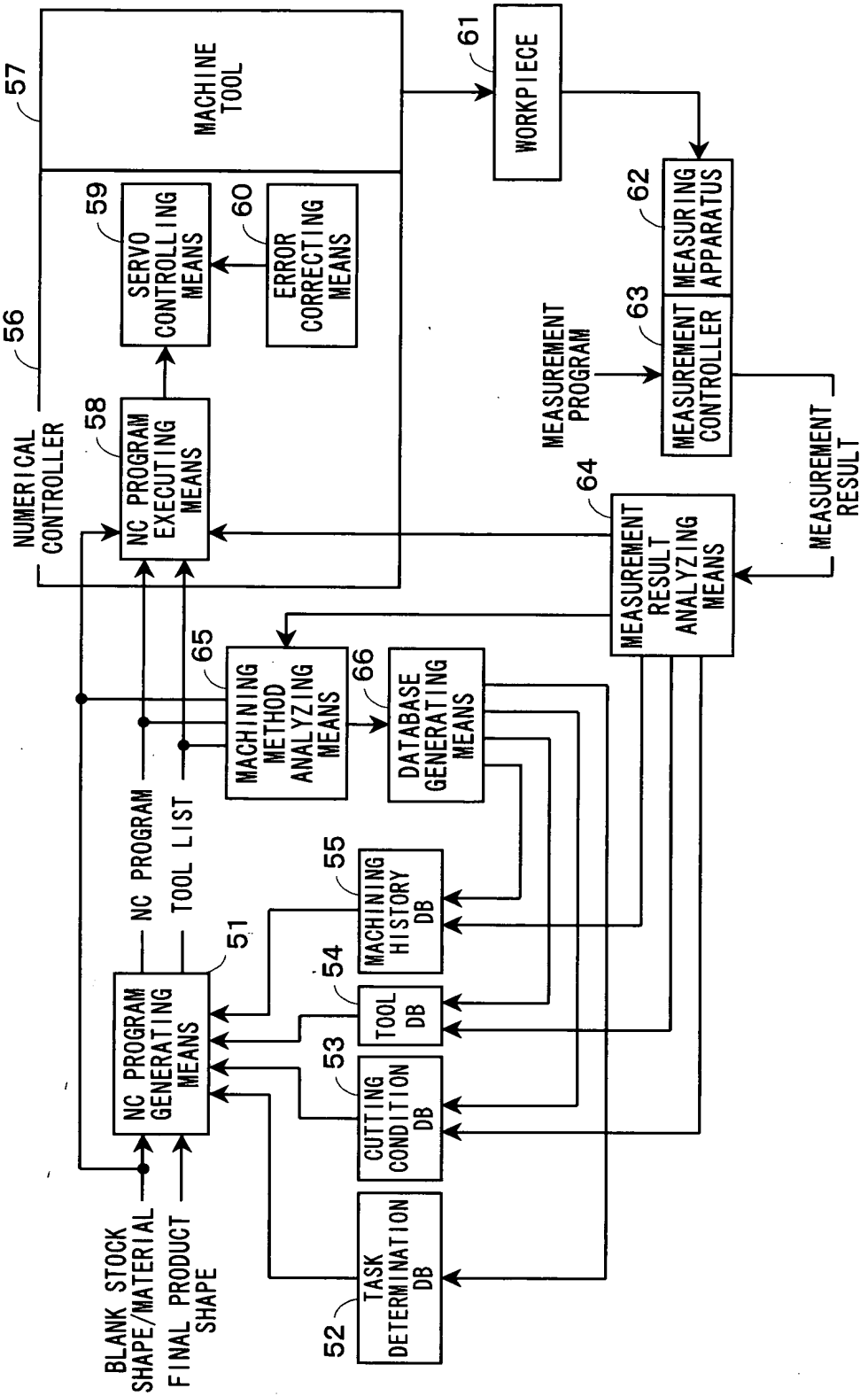

FIG. 2

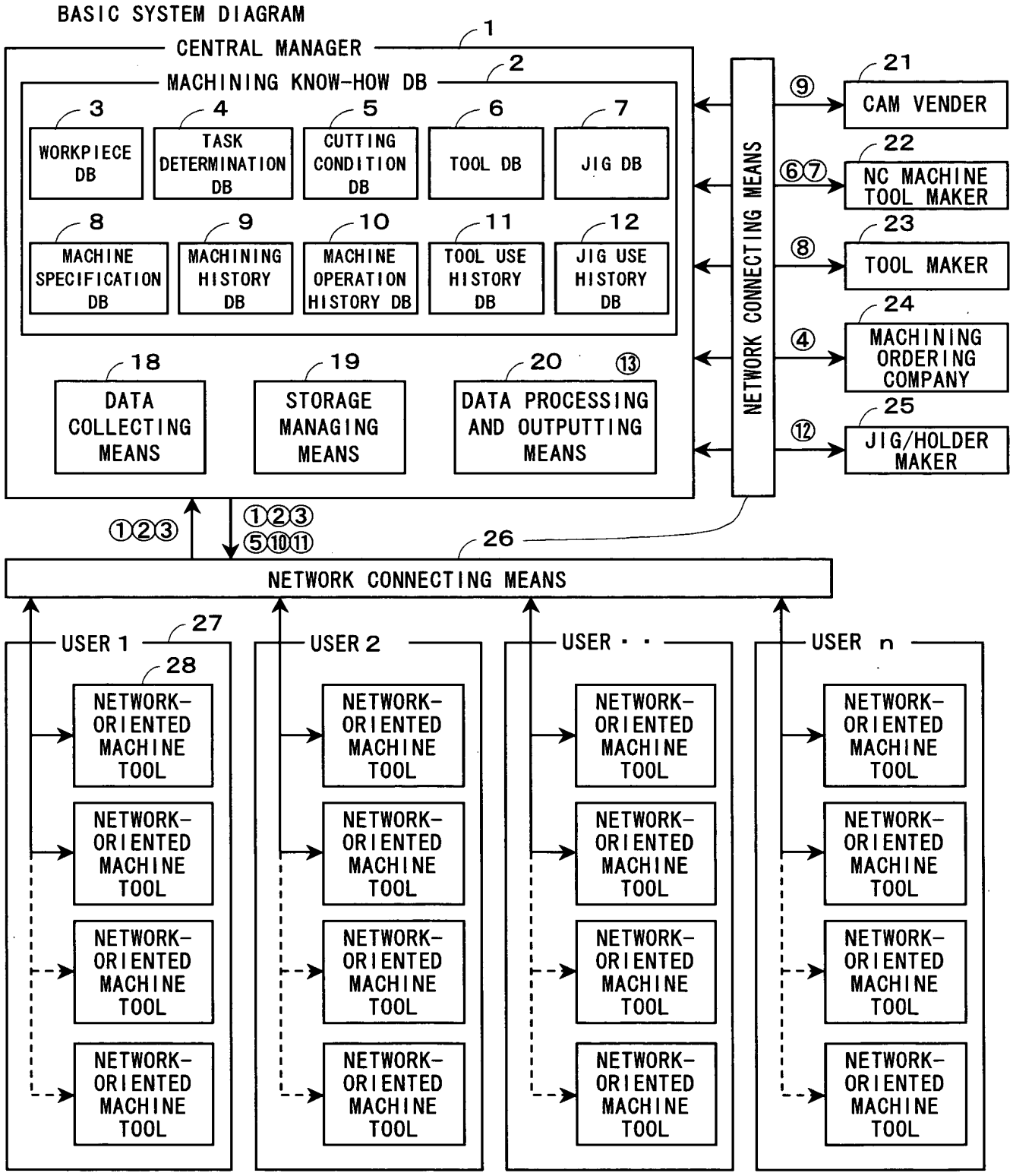
BASIC SYSTEM DIAGRAM
CENTRAL MANAGER
1
MACHINING KNOW-HOW DB
2
3
WORKPIECE DB
4
TASK DETERMINATION DB
5
CUTTING CONDITION DB
6
TOOL DB
7
JIG DB
8
MACHINE SPECIFICATION DB
9
MACHINING HISTORY DB
10
MACHINE OPERATION HISTORY DB
11
TOOL USE HISTORY DB
12
JIG USE HISTORY DB
18
DATA COLLECTING MEANS
19
STORAGE MANAGING MEANS
20
⑬
DATA PROCESSING AND OUTPUTTING MEANS
NETWORK CONNECTING MEANS
⑨
21
CAM VENDER
⑥⑦
22
NC MACHINE TOOL MAKER
⑧
23
TOOL MAKER
④
24
MACHINING ORDERING COMPANY
⑫
25
JIG/HOLDER MAKER
①②③
①②③ ⑤⑩⑪
26
NETWORK CONNECTING MEANS
27
USER 1
USER 2
USER · ·
USER n
28
NETWORK-ORIENTED MACHINE TOOL

FIG. 3

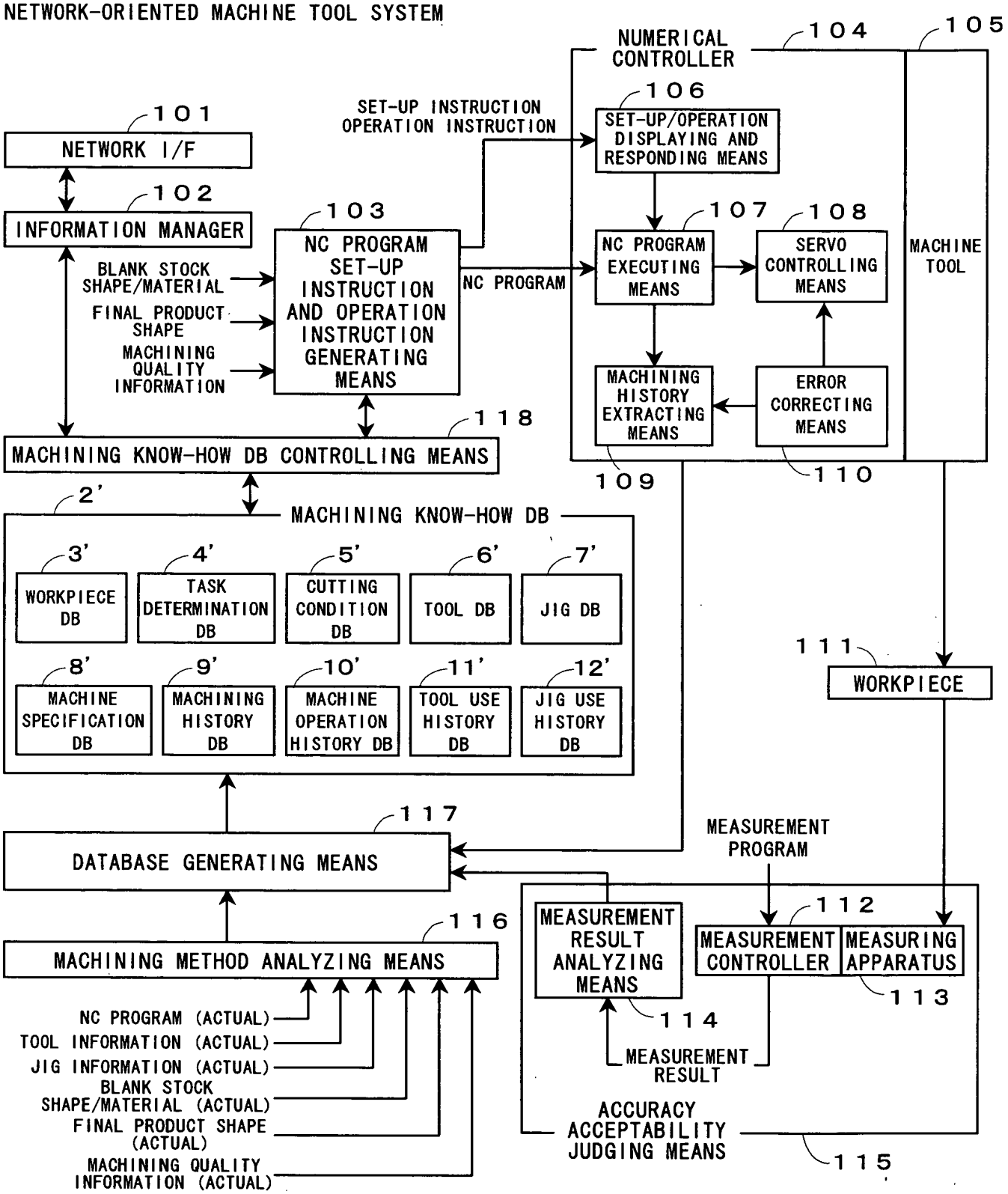
NETWORK-ORIENTED MACHINE TOOL SYSTEM
NUMERICAL CONTROLLER
104
105
101
NETWORK I/F
102
INFORMATION MANAGER
103
NC PROGRAM SET-UP INSTRUCTION AND OPERATION INSTRUCTION GENERATING MEANS
SET-UP INSTRUCTION
OPERATION INSTRUCTION
106
SET-UP/OPERATION DISPLAYING AND RESPONDING MEANS
BLANK STOCK SHAPE/MATERIAL
FINAL PRODUCT SHAPE
MACHINING QUALITY INFORMATION
NC PROGRAM
107
NC PROGRAM EXECUTING MEANS
108
SERVO CONTROLLING MEANS
MACHINE TOOL
MACHINING HISTORY EXTRACTING MEANS
ERROR CORRECTING MEANS
109
110
118
MACHINING KNOW-HOW DB CONTROLLING MEANS
2'
MACHINING KNOW-HOW DB
3'
WORKPIECE DB
4'
TASK DETERMINATION DB
5'
CUTTING CONDITION DB
6'
TOOL DB
7'
JIG DB
8'
MACHINE SPECIFICATION DB
9'
MACHINING HISTORY DB
10'
MACHINE OPERATION HISTORY DB
11'
TOOL USE HISTORY DB
12'
JIG USE HISTORY DB
111
WORKPIECE
117
DATABASE GENERATING MEANS
MEASUREMENT PROGRAM
112
MEASUREMENT CONTROLLER
MEASURING APPARATUS
113
MEASUREMENT RESULT ANALYZING MEANS
114
MEASUREMENT RESULT
116
MACHINING METHOD ANALYZING MEANS
NC PROGRAM (ACTUAL)
TOOL INFORMATION (ACTUAL)
JIG INFORMATION (ACTUAL)
BLANK STOCK SHAPE/MATERIAL (ACTUAL)
FINAL PRODUCT SHAPE (ACTUAL)
MACHINING QUALITY INFORMATION (ACTUAL)
ACCURACY ACCEPTABILITY JUDGING MEANS
115

FIG. 4

WORKPIECE DATABASE

MACHINE ID	WORKPIECE ID	FINAL PRODUCT SHAPE FILE NAME	BLANK STOCK SHAPE FILE NAME	MATERIAL	MACHINING PRODUCT MODEL ID	MACHINING PROGRAM NUMBER	MACHINING PRODUCT MODEL ACCURACY INFORMATION FILE NAME	MACHINING PRODUCT MODEL ACTUAL ACCURACY FILE NAME	MACHINING PART GROUP ID
M002	K543-0001	G54301	S23015	S45C	K543	00543	A543	A543-0001	P543-1
M002	K543-0001	G54301	S23015	S45C	K543	00543	A543	A543-0001	P543-1
M002	K543-0001	G54301	S23015	S45C	K543	00543	A543	A543-0001	P543-1
M002	K543-0001	G54301	S23015	S45C	K543	00543	A543	A543-0001	P543-1
M002	K543-0001	G54301	S23015	S45C	K543	00543	A543	A543-0001	P543-1
M002	K543-0001	G54301	S23015	S45C	K543	00543	A543	A543-0001	P543-1
M002	K543-0001	G54301	S23015	S45C	K543	00543	A543	A543-0001	P543-2
M002	K543-0001	G54301	S23015	S45C	K543	00543	A543	A543-0001	P543-2
M002	K543-0001	G54301	S23015	S45C	K543	00543	A543	A543-0001	P543-2

MACHINING PART GROUP ACCURACY INFORMATION FILE NAME	MACHINING PART GROUP ACTUAL ACCURACY FILE NAME	CLAMP INFORMATION FILE NAME	MACHINING PART ID	MACHINING PART NAME	MACHINING PART FILE NAME	MACHINING PART ACCURACY INFORMATION FILE NAME	MACHINING PART ACTUAL ACCURACY FILE NAME
W543-1	R543-1-0001	F23015-1	T543-1-1	SURFACE	F001	J543-1-1	J543-1-1-0001
W543-1	R543-1-0001	F23015-1	T543-1-2	POCKET	P001	J543-1-2	J543-1-2-0001
W543-1	R543-1-0001	F23015-1	T543-1-3	CHAMFERED HOLE	CH01	J543-1-3	J543-1-3-0001
W543-1	R543-1-0001	F23015-1	T543-1-4	CHAMFERED HOLE	CH02	J543-1-4	J543-1-4-0001
W543-1	R543-1-0001	F23015-1	T543-1-5	CHAMFERED HOLE	CH03	J543-1-5	J543-1-5-0001
W543-1	R543-1-0001	F23015-1	T543-1-6	CHAMFERED HOLE	CH04	J543-1-6	J543-1-6-0001
W543-2	R543-2-0001	F23015-2	T543-2-1	SURFACE	F002	J543-2-1	J543-2-1-0001
W543-2	R543-2-0001	F23015-2	T543-2-2	SEATED TAP	ZT01	J543-2-2	J543-2-2-0001
W543-2	R543-2-0001	F23015-2	T543-2-3	SEATED TAP	ZT02	J543-2-3	J543-2-3-0001

FIG. 5

TASK DETERMINATION DATABASE

MACHINE ID	TASK DETERMINATION ID	MACHINING PART ID	PART MACHINING ID	PART MACHINING NAME	MACHINING TASK ID	MACHINING TASK NAME	MACHINING TASK SEQUENCE	TOOL ID	TOOL PATH FILE NAME	MACHINING TASK ACCURACY INFORMATION FILE NAME	MACHINING TASK ACTUAL ACCURACY FILE NAME	MACHINING TASK PERIOD FILE NAME
M002	1	T543-1-1	U543-1-1	SURFACE	V543-1-1-1	ROUGH SURFACING	1-1	1	M002TL001	Q543-1-1-1	U543-1-1-1-0001	T543-1-1-1
M002	2	T543-1-1	U543-1-1	SURFACE	V543-1-1-2	FINISH SURFACING	1-2	29	M002TL002			T543-1-1-2
M002	3	T543-1-2	U543-1-2	POCKET	V543-1-2-1	CENTERING	1-5	2	M002TL003			T543-1-2-1
M002	4	T543-1-2	U543-1-2	POCKET	V543-1-2-2	DRILLING	1-16	4	M002TL004			T543-1-2-2
M002	5	T543-1-2	U543-1-2	POCKET	V543-1-2-3	ROUGH POCKET MACHINING	1-17	5	M002TL005	Q543-1-2-3	U543-1-2-3-0001	T543-1-2-3
M002	6	T543-1-2	U543-1-2	POCKET	V543-1-2-4	FINISH POCKET MACHINING	1-18	6	M002TL006			T543-1-2-4
M002	7	T543-1-3	U543-1-3	CHAMFERED HOLE	V543-1-3-1	CENTERING	1-3	1	M002TL007			T543-1-3-1
M002	8	T543-1-3	U543-1-3	CHAMFERED HOLE	V543-1-3-2	DRILLING	1-8	3	M002TL008			T543-1-3-2
M002	9	T543-1-3	U543-1-3	CHAMFERED HOLE	V543-1-3-3	CHAMFERING	1-12	8	M002TL009			T543-1-3-3
M002	10	T543-1-4	U543-1-4	CHAMFERED HOLE	V543-1-4-1	CENTERING	1-6	1	M002TL010			T543-1-4-1
M002	11	T543-1-4	U543-1-4	CHAMFERED HOLE	V543-1-4-2	DRILLING	1-11	3	M002TL011			T543-1-4-2
M002	12	T543-1-4	U543-1-4	CHAMFERED HOLE	V543-1-4-3	CHAMFERING	1-15	8	M002TL012			T543-1-4-3
M002	13	T543-1-5	U543-1-5	CHAMFERED HOLE	V543-1-5-1	CENTERING	1-4	1	M002TL013			T543-1-5-1
M002	14	T543-1-5	U543-1-5	CHAMFERED HOLE	V543-1-5-2	DRILLING	1-9	3	M002TL014			T543-1-5-2
M002	15	T543-1-5	U543-1-5	CHAMFERED HOLE	V543-1-5-3	CHAMFERING	1-13	8	M002TL015			T543-1-5-3
M002	16	T543-1-6	U543-1-6	CHAMFERED HOLE	V543-1-6-1	CENTERING	1-7	1	M002TL016			T543-1-6-1
M002	17	T543-1-6	U543-1-6	CHAMFERED HOLE	V543-1-6-2	DRILLING	1-10	3	M002TL017			T543-1-6-2
M002	18	T543-1-6	U543-1-6	CHAMFERED HOLE	V543-1-6-3	CHAMFERING	1-14	8	M002TL018			T543-1-6-3
M002	19	T543-2-1	U543-2-1	SURFACE	V543-2-1-1	ROUGH SURFACING	2-1	1	M002TL019	Q543-2-1-1	U543-2-1-1-0001	T543-2-1-1
M002	20	T543-2-1	U543-2-1	SURFACE	V543-2-1-2	FINISH SURFACING	2-2	29	M002TL020			T543-2-1-2
M002	21	T543-2-2	U543-2-2	SEATED TAP	V543-2-2-1	CENTERING	2-3	1	M002TL021			T543-2-2-1
M002	22	T543-2-2	U543-2-2	SEATED TAP	V543-2-2-2	DRILLING	2-5	13	M002TL022			T543-2-2-2
M002	23	T543-2-2	U543-2-2	SEATED TAP	V543-2-2-3	END MILLING	2-7	20	M002TL023	Q543-2-2-3	U543-2-2-3-0001	T543-2-2-3
M002	24	T543-2-2	U543-2-2	SEATED TAP	V543-2-2-4	TAPPING	2-9	16	M002TL024			T543-2-2-4
M002	25	T543-2-3	U543-2-3	SEATED TAP	V543-2-3-1	CENTERING	2-4	1	M002TL025			T543-2-3-1
M002	26	T543-2-3	U543-2-3	SEATED TAP	V543-2-3-2	DRILLING	2-6	13	M002TL026			T543-2-3-2
M002	27	T543-2-3	U543-2-3	SEATED TAP	V543-2-3-3	END MILLING	2-8	20	M002TL027	Q543-2-3-3	U543-2-3-3-0001	T543-2-3-3
M002	28	T543-2-3	U543-2-3	SEATED TAP	V543-2-3-4	TAPPING	2-10	16	M002TL028			T543-2-3-4

FIG. 6

TOOL PATH FILE(M002TL001)

RP = REFERENCE POINT

MACHINE ID	X-AXIS COORDINATE OF START POINT	Y-AXIS COORDINATE OF START POINT	Z-AXIS COORDINATE OF START POINT	X-AXIS COORDINATE OF END POINT	Y-AXIS COORDINATE OF END POINT	Z-AXIS COORDINATE OF END POINT	S	M	F	AXIS	INTERPOLATION
M002	RP	RP	RP	160.000	50.000	RP	400	3		XY	G0
M002	160.000	50.000	RP	160.000	50.000	50.000		8		Z	G0
M002	160.000	50.000	50.000	160.000	50.000	0.100			2000	Z	G0
M002	160.000	50.000	0.100	-160.000	50.000	0.100			250	X	G1
M002	-160.000	50.000	0.100	-160.000	-45.000	0.100				Y	G0
M002	-160.000	-45.000	0.100	160.000	-45.000	0.100				X	G1
M002	160.000	-45.000	0.100	160.000	50.000	0.100	600			Y	G0

MACHINING TASK ID	MATERIAL	TOOL ID	CUTTING SPEED	FEED PER TOOTH	FEED PER REVOLUTION	CUTTING WIDTH	CUTTING HEIGHT
V543-1-1-1	S45C	1					
V543-1-1-1	S45C	1					
V543-1-1-1	S45C	1					
V543-1-1-1	S45C	1	100	0.1		80.000	5.000
V543-1-1-1	S45C	1					
V543-1-1-1	S45C	1	100	0.1		80.000	5.000
V543-1-1-1	S45C	1					

FIG. 7

CUTTING CONDITION DATABASE

F1: RADIAL FEED PER TOOTH W: CUTTING WIDTH FOR EACH FEED
F2: AXIAL FEED PER REVOLUTION H: CUTTING HEIGHT FOR EACH FEED

MACHINE ID	CUTTING CONDITION ID	MACHINING TASK NAME	WORKPIECE MATERIAL	CUTTING SPEED	F1	F2	W	H
M0002	1	ROUGH MILLING	S45C	125.6	0.1	-	80	4.9
M0002	2	CENTERING	S45C	9.4	-	0.1	-	-
M0002	3	DRILLING	S45C	25.1	-	0.2	-	-
M0002	4	DRILLING	S45C	28.3	-	0.2	-	-
M0002	5	ROUGH POCKET MACHINING	S45C	27.5	0.07	0.1	25	19.9
M0002	6	FINISH POCKET MACHINING	S45C	39.2	0.1	0.1	0.1	0.1
M0002	7	DRILLING	S45C	25.7	-	0.15	-	-
M0002	8	CHAMFERING	S45C	25	-	0.1	-	-
M0002	9	TAPPING	S45C	10	-	1.25	-	-

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FIG. 8 (a)

TOOL DATABASE (1/2)

MACHINE ID	TOOL ID	TOOL NAME	MAKER NAME	HOLDER MODEL	TIP MODEL	TIP MATERIAL	NOMINAL DIAMETER	H-CODE	D-CODE	TOOTH NUMBER	TOOTH LENGTH	TOOL LENGTH
M002	1	FACE MILL	ABC	A-01	B-01	CEMENTED CARBIDE	80.000	1	1	6	10.000	20.000
M002	2	CENTER DRILL	ABC	A-02	B-02	HIGH-SPEED STEEL	3.000	2	2	—	5.000	20.000
M002	3	DRILL	ABC	A-03	B-03	HIGH-SPEED STEEL	20.000	3	3	—	150.000	160.000
M002	4	DRILL	ABC	A-04	B-04	HIGH-SPEED STEEL	30.000	4	4	—	150.000	160.000
M002	5	END MILL	ABC	A-05	B-05	HIGH-SPEED STEEL	25.000	5	5	2	50.000	50.000
M002	6	END MILL	ABC	A-06	B-06	HIGH-SPEED STEEL	25.000	6	6	2	35.000	50.000
M002	7	DRILL	ABC	A-07	B-07	HIGH-SPEED STEEL	8.200	7	7	—	50.000	100.000
M002	8	CHAMFER	ABC	A-08	B-08	HIGH-SPEED STEEL	25.000	8	8	2	10.000	80.000
M002	9	TAP	ABC	A-09	B-09	HIGH-SPEED STEEL	M10	9	9	—	30.000	50.000
M002	10	DRILL	ABC	A-10	B-10	HIGH-SPEED STEEL	3.000	10	10	-	100.000	-
M002	11	DRILL	ABC	A-11	B-11	HIGH-SPEED STEEL	5.100	11	11	-	100.000	-
M002	12	DRILL	ABC	A-12	B-12	HIGH-SPEED STEEL	6.500	12	12	-	100.000	-
M002	13	DRILL	ABC	A-13	B-13	HIGH-SPEED STEEL	6.800	13	13	-	120.000	-
M002	14	DRILL	ABC	A-14	B-14	HIGH-SPEED STEEL	8.000	14	14	-	120.00	-
M002	15	DRILL	ABC	A-15	B-15	HIGH-SPEED STEEL	10.000	15	15	-	120.000	-
M002	16	TAP	ABC	A-16	B-16	HIGH-SPEED STEEL	M8	16	16	-	30.000	-
M002	17	TAP	ABC	A-17	B-17	HIGH-SPEED STEEL	M6	17	17	-	30.000	-
M002	18	TAP	ABC	A-18	B-18	HIGH-SPEED STEEL	M12	18	18	-	35.000	-
M002	19	TAP	ABC	A-19	B-19	HIGH-SPEED STEEL	M14	19	19	-	35.000	-
M002	20	END MILL	ABC	A-20	B-20	HIGH-SPEED STEEL	6.000	20	20	2	20.000	-
M002	21	END MILL	ABC	A-21	B-21	HIGH-SPEED STEEL	8.000	21	21	2	25.000	-
M002	22	END MILL	ABC	A-22	B-22	HIGH-SPEED STEEL	10.000	22	22	2	25.000	-
M002	23	END MILL	ABC	A-23	B-23	HIGH-SPEED STEEL	12.000	23	23	2	25.000	-
M002	24	CENTER DRILL	ABC	A-24	B-24	HIGH-SPEED STEEL	5.000	24	24	-	3.000	-
M002	25	CENTER DRILL	ABC	A-25	B-25	HIGH-SPEED STEEL	1.000	25	25	-	3.000	-
M002	26	CHAMFER	ABC	A-26	B-26	HIGH-SPEED STEEL	20.000	26	26	1	10.000	-
M002	27	END MILL	ABC	A-27	B-27	HIGH-SPEED STEEL	35.000	27	27	2	50.000	-
M002	28	END MILL	ABC	A-28	B-28	HIGH-SPEED STEEL	16.000	28	28	2	30.000	-
M002	29	FACE MILL	ABC	A-29	B-29	HIGH-SPEED STEEL	100.000	29	29	6	15.000	-
M002	30	DRILL	ABC	A-30	B-30	HIGH-SPEED STEEL	21.000	30	30	-	100.000	-
M002	31	DRILL	ABC	A-31	B-31	HIGH-SPEED STEEL	22.000	31	31	-	100.000	-
M002	32	DRILL	ABC	A-32	B-32	HIGH-SPEED STEEL	25.000	32	32	-	100.000	-

FIG. 8 (b)

TOOL DATABASE (2/2)

PITCH	ANGLE	WEAR	SERVICE LIFE	LIFE EXPECTANCY	SERVICE LIFE STATUS
—	90	-0.030	80,000	8,925	OK
—	—	0.000	30,000	4,388	OK
—	118	0.000	30,000	10,812	OK
—	118	-0.010	30,000	66,666	OK
—	-	0.000	90,000	9,900	OK
—	—	0.000	80,000	8,164	OK
—	—	0.000	80,000	64,473	OK
—	45	0.000	80,000	10,504	OK
1.25	45	0.000	60,000	22,963	OK
-	118	-0.050	30,000	3,564	OK
-	118	0.000	70,000	2,116	OK
-	118	0.000	30,000	11,580	OK
-	118	0.000	70,000	53,092	OK
-	118	0.000	50,000	32,659	OK
-	118	0.000	90,000	7,165	OK
1.25	-	0.000	90,000	36,622	OK
1.00	-	0.000	50,000	8,937	OK
1.75	-	0.000	20,000	8,924	OK
2.00	-	0.000	30,000	58,622	OK
-	-	-0.080	30,000	0	END
-	-	0.000	70,000	9,472	OK
-	-	0.000	70,000	22,044	OK
-	-	0.000	80,000	0	END
-	-	0.000	70,000	3,029	OK
-	-	0.000	80,000	82,051	OK
-	45	0.000	20,000	79,805	OK
-	-	0.000	50,000	11,428	OK
-	-	-0.020	50,000	6,164	OK
-	45	-0.030	50,000	20,976	OK
-	118	0.000	50,000	53,214	OK
-	118	0.000	80,000	44,158	OK
-	118	0.000	80,000	0	END

FIG. 9

JIG DATABASE

(KN)

JIG ID	TYPE	MAKER NAME	MODEL	NAME	CLAMPING FORCE
1	CHUCK	F I X	C－１２３	POWER CHUCK	20
2	VICE	F I X	V－１１６	POWER VICE	40
3	ROUND TABLE	F I X	E－１２２	PRECISION ROUND TABLE	15
4	BLOCK	F I X	B－２２１	PRECISION BLOCK	20
5	BLOCK	F I X	B－２２２	PRECISION BLOCK	20
6	BLOCK	F I X	B－２２３	PRECISION BLOCK	20

FIG. 10

MACHINE SPECIFICATION DATABASE

MACHINE ID	MACHINE TYPE	MACHINE MAKER NAME	MACHINE MODEL	MACHINE S/N	MOVEMENT (X)	MOVEMENT (Y)	MOVEMENT (Z)	MAXIMUM MACHINING SIZE (DIAMETER)	MAXIMUM MACHINING HEIGHT (LENGTH)
M001	LATHE	DDM	LL-1	056	220	-	400	370	500
M002	MACHINING CENTER	DDM	MM-1	012	560	460	450	500×500	400
M003	LATHE	FFM	LT	185	250	-	600	410	550
M004	LATHE	DDM	LL-2	256	300	-	800	370	600
M005	MACHINING CENTER	DDM	MM-2	109	560	610	560	500×500	500
M006	MACHINING CENTER	FFM	MT	001	630	600	650	500×500	500
M007	LATHE	FFM	LF	302	345	-	995	620	958
M008	MACHINING CENTER	FFM	MK	077	1020	510	510	1100×600	400

SPINDLE ROTATION SPEED	NUMBER OF SPINDLE SPEED RANGES	DIAMETER OF SPINDLE HOLE	ROTARY TOOL SPINDLE ROTATION SPEED	RAPID FEED RATE (X)	RAPID FEED RATE (Y)	RAID FEED RATE (Z)	TOOL SHANK TYPE	PULL-STUD TYPE
4500	-	40	-	12000	-	12000	-	-
6000	2	-	-	20000	20000	20000	MAS BT-40	MAS I
3000	-	50	2000	15000	-	15000	-	-
3000	-	50	3000	10000	-	10000	-	-
10000	-	-	-	20000	20000	20000	MAS BT-40	MAS I
12000	-	-	-	20000	20000	20000	MAS BT-40	MAS I
2400	2	130	-	20000	-	24000	-	-
8000	-	-	-	10000	10000	10000	MAS BT-40	MAS I

NUMBER OF ACCOMMODATED TOOLS (NUMBER OF ATTACHED TOOLS)	MAXIMUM TOOL DIAMETER	MAXIMUM TOOL WEIGHT	TOOL CHANGE TIME	SPINDLE MOTOR (30 MINUTES/CONTINUOUS)	FEED AXIS MOTOR	REQUIRED POWER
12	16	-	0.3	15/11	4	20.0
40	125	450	1.2	30/22	10	50.0
8	16	-	0.1	15/11	5	20.0
8	32	-	0.2	22/15	5	30.0
20	120	600	2.0	22/15	6	30.0
30	100	800	1.5	22/15	8	30.0
12	32	-	0.4	30/22	5.0	52.6
80	150	1000	1.6	30/22	10.0	55.0

FIG. 11

MACHINING HISTORY DATABASE

MACHINE ID	MACHINING HISTORY ID	WORKPIECE ID	ACCURACY ACCEPTABILITY JUDGMENT	MACHINING START TIME	MACHINING END TIME
M002	1	K543-0001	ACCEPTABLE	1998/12/07 09:12:20	1998/12/07 09:24:33
M002	2	K543-0002	ACCEPTABLE	1998/12/07 09:26:01	1998/12/07 09:38:14
M002	3	K543-0003	ACCEPTABLE	1998/12/07 09:40:05	1998/12/07 09:52:19
M002	4	K543-0004	ACCEPTABLE	1998/12/07 09:54:10	1998/12/07 10:06:23
M002	5	K543-0005	ACCEPTABLE	1998/12/07 10:08:07	1998/12/07 10:20:20
M002	6	K543-0006	ACCEPTABLE	1998/12/07 10:22:43	1998/12/07 10:34:57
M002	7	K543-0007	ACCEPTABLE	1998/12/07 10:36:25	1998/12/07 10:48:39
M002	8	K543-0008	UNACCEPTABLE	1998/12/07 10:50:38	1998/12/07 11:02:53

FIG. 12 (a)

MACHINE OPERATION HISTORY DATABASE (1/7)

MACHINE ID	POWER	
	ON	OFF
M0002	1998/12/07 08:45:20	
M0002		
M0002		
M0002		
M0002		
M0002		
M0002		
M0002		
M0002		
M0002		
M0002		
M0002		
M0002		
M0002		
~	~	~
M0002		
M0002		
M0002		
M0002		
M0002		
M0002		
M0002		
M0002		
M0002		
M0002		
M0002		
M0002		
M0002	

FIG. 12 (b)

MACHINE OPERATION HISTORY DATABASE (2/7)

NC MODE		
AUTOMATIC	MDI	MANUAL
1998/12/07 08:45:40		
		1998/12/07 08:48:21
1998/12/07 09:12:00		
~	~	~
		1998/12/07 11:03:18
1998/12/07 11:25:12		
		1998/12/07 11:42:08
1998/12/07 11:55:15		

EL 045 056 958 US

FIG. 12 (c)

MACHINE OPERATION HISTORY DATABASE (3/7)

NC STATE		
SET-UP COMPLETION	CYCLE START	PAUSE
1998/12/07 08:45:40		
	1998/12/07 09:12:20	
1998/12/07 09:24:33		
~	~	~
	1998/12/07 10:36:25	
1998/12/07 10:48:39		
	1998/12/07 10:50:38	
1998/12/07 11:02:53		
	1998/12/07 11:25:15	
		1998/12/07 11:26:33
	1998/12/07 11:35:01	
1998/12/07 11:38:10		
	1998/12/07 11:57:00	
1998/12/07 12:01:24		

EP0495929B2

FIG. 12 (d)

MACHINE OPERATION HISTORY DATABASE (4/7)

PROGRAM SELECTION	
PROGRAM NUMBER	SELECTION TIME
00543	1998/12/07 08:46:08
01286	1998/12/07 11:03:21

09525904.050299

FIG. 12 (e)

MACHINE OPERATION HISTORY DATABASE (5/7)

ALARM		
ALARM ID	ISSUED	CANCELED
ALM01	1998/12/07 08:45:40	
ALM01		1998/12/07 08:45:45
~	~	~
EX0570	1998/12/07 11:36:45	
EX0570		1998/12/07 11:55:02

JP0459-0202US

FIG. 12 (f)

MACHINE OPERATION HISTORY DATABASE (6/7)

SET-UP		DOOR OPENING AND CLOSING	
START	END	DOOR OPENING	DOOR CLOSING
1998/12/07 08:46:02			
		1998/12/07 08:48:24	
	1998/12/07 09:11:45		
			1998/12/07 09:12:18
~	~		
		1998/12/07 10:48:41	
			1998/12/07 10:50:36
		1998/12/07 11:02:58	
1998/12/07 11:03:15			
	1998/12/07 11:25:05		
			1998/12/07 11:25:13
		1998/12/07 11:26:34	
			1998/12/07 11:34:59
		1998/12/07 11:38:10	
			1998/12/07 11:55:17
		1998/12/07 12:01:26	
			1998/12/07 12:02:11

JP04965-02202

FIG. 12 (g)

MACHINE OPERATION HISTORY DATABASE (7/7)

MAINTENANCE	
START	END
~	~
1998/12/07 11:41:45	
	1998/12/07 11:55:10

10049629 - 091299

FIG. 13

TOOL USE HISTORY DATABASE

MACHINE ID	TOOL ID	WORKPIECE ID	MATERIAL	CUTTING SPEED	CUTTING DISTANCE	CUTTING WIDTH	CUTTING DEPTH	AXIAL FEED	RADIAL FEED	MACHINING START TIME
M0002	1	K543	S45C	100	320	80	5.000	0	250	1998/12/07 09:12:00
M0002	1	K543	S45C	100	320	80	5.000	0	250	1998/12/07 09:13:18
M0002	1	K543	S45C	100	320	80	0.500	0	400	1998/12/07 09:14:36
M0002	1	K543	S45C	100	320	80	0.500	0	400	1998/12/07 09:15:27
M0002	2	K543	S45C	40	3	-	3.000	100	0	1998/12/07 09:16:30
M0002	2	K543	S45C	40	3	-	3.000	100	0	1998/12/07 09:16:32
M0002	2	K543	S45C	40	3	-	3.000	100	0	1998/12/07 09:16:33
M0002	2	K543	S45C	40	3	-	3.000	100	0	1998/12/07 09:16:35
M0002	2	K543	S45C	40	3	-	3.000	100	0	1998/12/07 09:16:37

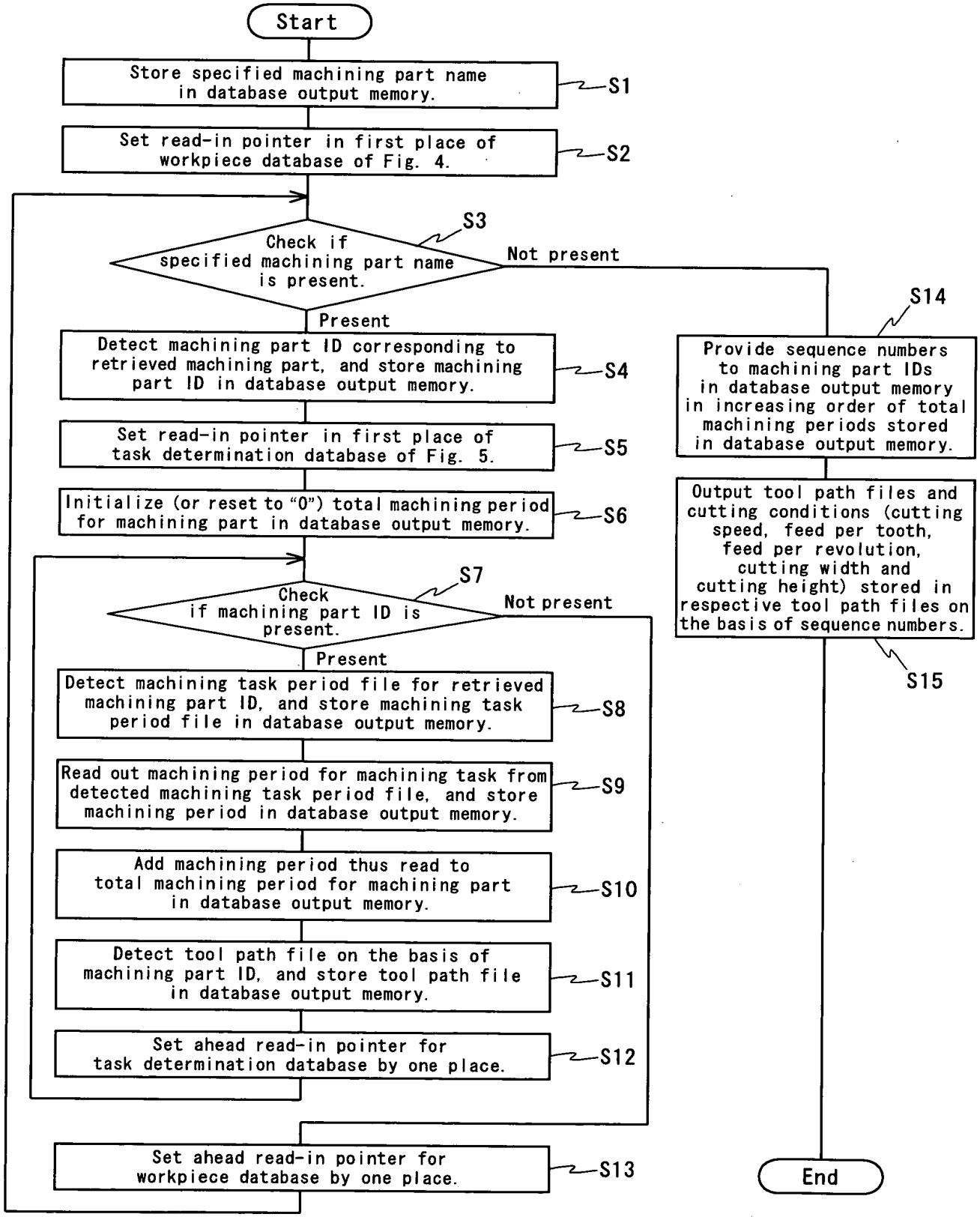
FIG. 14

JIG USE HISTORY DATABASE

MACHINE ID	JIG ID	WORKPIECE ID	JIG ATTACHED POSITION (X)	JIG ATTACHED POSITION (Y)	JIG ATTACHED POSITION (Z)	JIG ATTACHED ANGLE	JIG ATTACHMENT TIME	JIG DETACHMENT TIME
M0002	4	K122	-100.000	100.000	105.000	0.000	1998/12/01 15:20	1998/12/04 16:30
M0002	4	K122	0.000	100.000	105.000	0.000	1998/12/01 15:20	1998/12/04 16:30
M0002	4	K122	100.000	100.000	105.000	0.000	1998/12/01 15:20	1998/12/04 16:30
M0002	4	K122	-100.000	-100.000	105.000	180.000	1998/12/01 15:20	1998/12/04 16:30
M0002	4	K122	0.000	-100.000	105.000	180.000	1998/12/01 15:20	1998/12/04 16:30
M0002	4	K122	100.000	-100.000	105.000	180.000	1998/12/01 15:20	1998/12/04 16:30
M0002	2	K543	150.000	0.000	-100.000	0.000	1998/12/04 17:38	

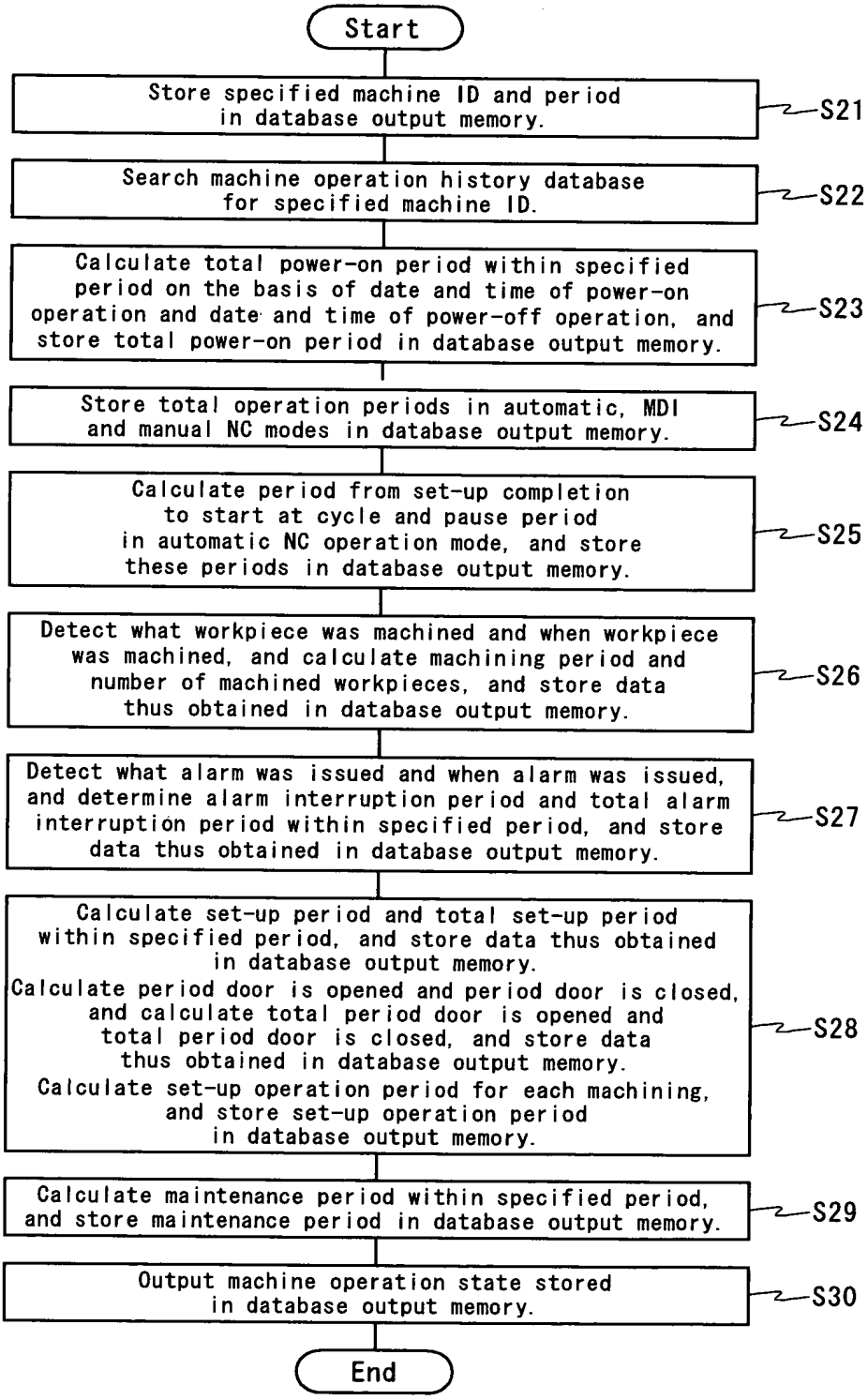
MACHINING END TIME	CUTTING FLUID
1998/12/07 09:13:17	NO
1998/12/07 09:14:35	NO
1998/12/07 09:15:26	NO
1998/12/07 09:16:15	NO
1998/12/07 09:16:31	NO
1998/12/07 09:16:33	NO
1998/12/07 09:16:34	NO
1998/12/07 09:16:36	NO
1998/12/07 09:16:38	NO

FIG. 15



JP2002-062926

FIG. 16



20020904a 20020904 0204

FIG. 17

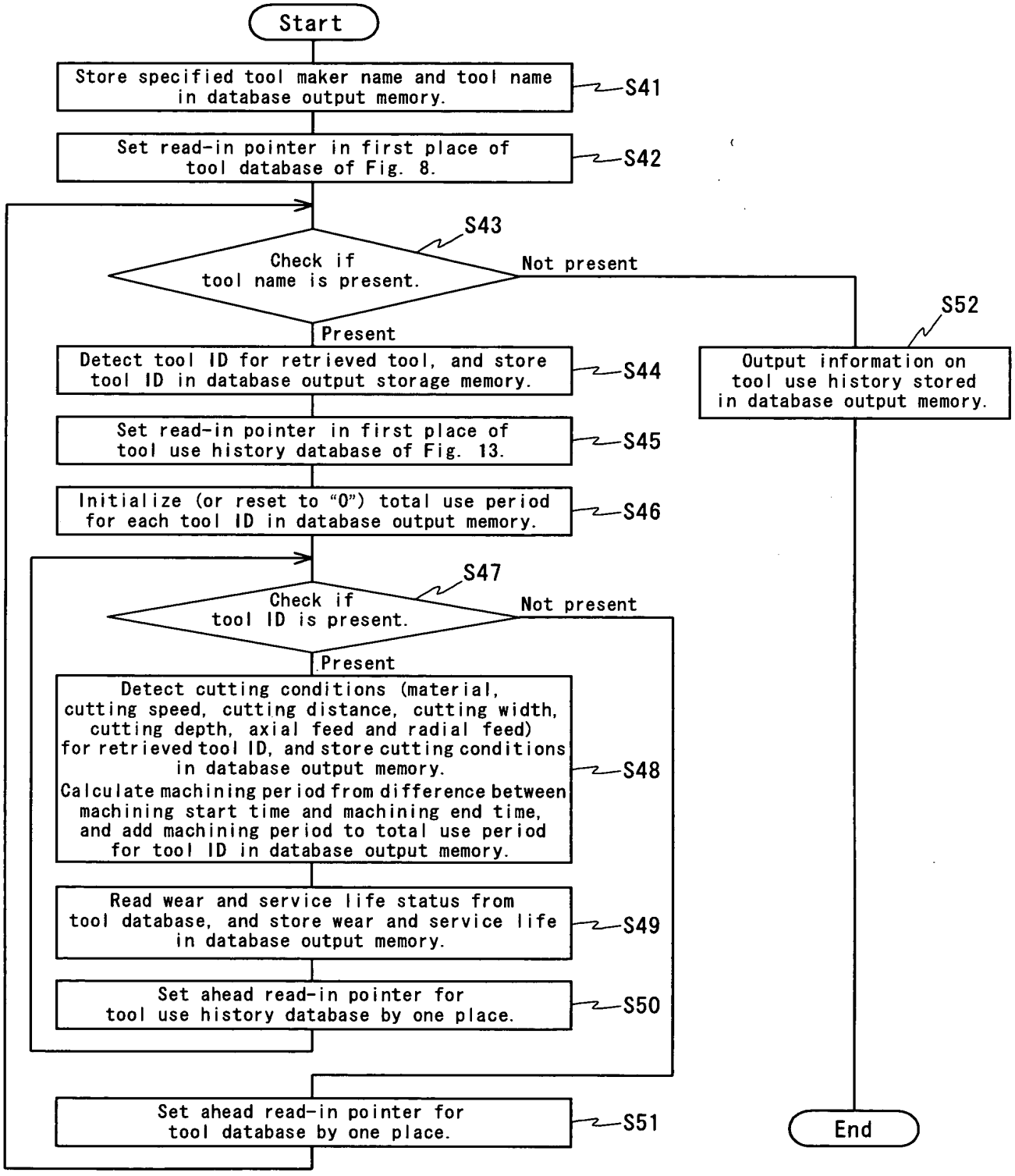
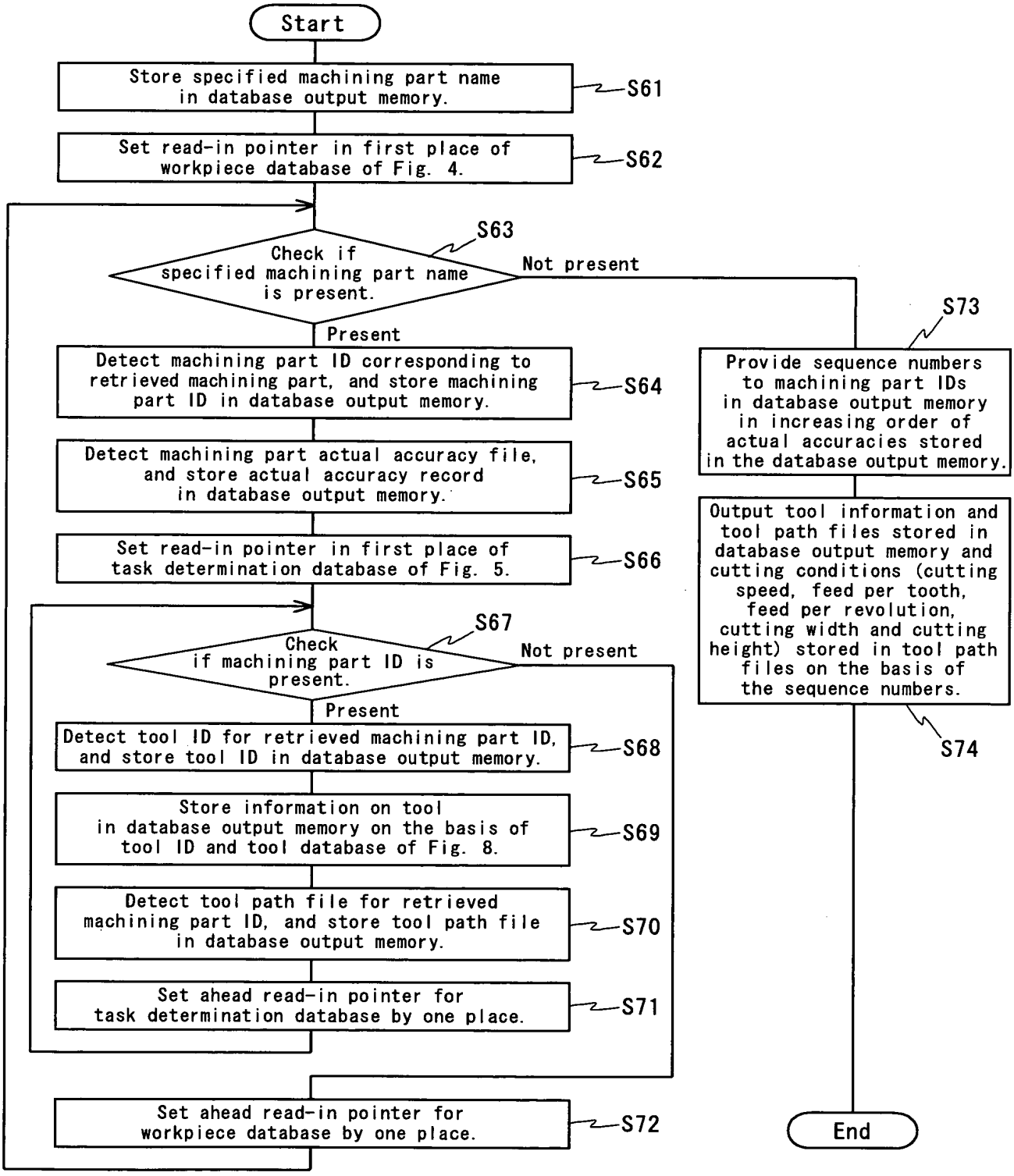

Start
Store specified tool maker name and tool name in database output memory.
S41
Set read-in pointer in first place of tool database of Fig. 8.
S42
S43
Check if tool name is present.
Not present
Present
S52
Output information on tool use history stored in database output memory.
Detect tool ID for retrieved tool, and store tool ID in database output storage memory.
S44
Set read-in pointer in first place of tool use history database of Fig. 13.
S45
Initialize (or reset to "0") total use period for each tool ID in database output memory.
S46
S47
Check if tool ID is present.
Not present
Present
Detect cutting conditions (material, cutting speed, cutting distance, cutting width, cutting depth, axial feed and radial feed) for retrieved tool ID, and store cutting conditions in database output memory.
Calculate machining period from difference between machining start time and machining end time, and add machining period to total use period for tool ID in database output memory.
S48
Read wear and service life status from tool database, and store wear and service life in database output memory.
S49
Set ahead read-in pointer for tool use history database by one place.
S50
Set ahead read-in pointer for tool database by one place.
S51
End

FIG. 18



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